Performance Analysis of Islamic Banks in Indonesia Using Machine Learning

Mahrus Ali, Rahmat Gernowo, and Budi Warsito

Abstract. This study aims to examine several factors that influence the performance of Islamic banks in Indonesia by using the variables Return On Assets (ROA), Operating Expenses for Operating Income (BOPO), Capital Adequacy Ratio (CAR), Non Performing Financing (NPF), Financing to Deposit Ratio (FDR) and Potential Losses (PK). The data used in the study takes secondary data from the website of the Financial Services Authority (OJK) from the recapitulation of reports from Islamic banks throughout Indonesia, data taken from 2011 to 2020 which is a combination of Time series and cross section data. The analysis technique used is machine learning with multiple linear regression. The results of the study after being calculated using SPSS, the t table value is 2.776 and the F table value is 5.05. The final result is the hypothesis (H6) is accepted, which means that the variables X1, X2, X3, X4, X5 have a simultaneous effect on Y. Then the ROA value simultaneously influenced by the value of BOPO, CAR, NPF, FDR AND PK.

1 Introduction

As a country with a Muslim population biggest, Indonesia should be the pioneer and the mecca of Islamic finance development in the world [1]. Religious and economic values have positive effects on depositors’ trust at both the micro and macro levels. Our results also document that risk-taking behavior is positively associated with depositors’ trust. Furthermore, we find that more-educated depositors have significantly less trust. This finding might imply that the erosion of market discipline by depositors in a country with relatively generous deposit insurance, such as Indonesia, can be mitigated through greater financial literacy [2].

According to Law no. 21 of 2008 article 1, Islamic banking is everything that concerning Islamic Banks and Units Sharia Business, including institutional, business activities, as well as the methods and processes in carry out its business activities. Study conducted by [6] suggested that the impact of The merger of Islamic commercial banks provides positive impact, so that Islamic Banks Indonesia (BSI) is able to compete globally by prioritizing more service complete, the range becomes wider, and better capital. Bank Merger Indonesian

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Sharia (BSI) in the midst of a pandemic Covid-19 is expected to produce good so that it will be able to contribute to the recovery of the national economy (PEN) which is predicted by government, in particular with regard to growth of the halal industry[7].

states that the assessment of the financial performance of Islamic banks can be known through financial statements consisting of statements of financial position, income statements, cash flow statements, and equity statements. Financial reports in the form of balance sheets provide information about the financial condition of banks to outside parties, such as Bank Indonesia, the public and investors[8]. While the income statement provides information about developments bank finance to all parties, both owners, bank management, the public, and other parties. Information about bank finances can be used to assess bank performance in implementing prudential principles and applicable regulations[9].

1.1 Sharia Banking Performance Indicators

According to OJK in the Report Development of Indonesian Islamic Finance 2020, Islamic banking performance indicators consist of: on capital, asset quality, profitability, efficiency, and liquidity. Analysis from the side capital, seen by using the value of capital ratio or Capital Adequacy Ratio (CAR). CAR shows the bank's ability in providing funds to cover the risk of any financing or assets risky productivity[9]. Therefore the higher the CAR it will increase bank's ability to generate profit[9]. Meanwhile, Return on Assets (ROA) is a ratio that show net profit after tax to the total assets. how much effectively the company manages its assets owned to earn income, can be seen through the ROA value. It means, the greater the ROA value, the higher profit value achieved by the company based on the side of the use of assets[10].

The Non-Performing Financing Ratio (NPF) is used to measure the extent to which the ability of a bank to manage credit or financing problems. However the higher the NPF ratio, the more high risk of financing that must be borne. As a result, the bank must be able to provide a reserve fund greater to cover the risk[11].

Of course, this is closely related to efficiency because it has to align costs operations with operating income obtained by the bank itself mainly in the implementation of credit or financing. As for the ratio that shows business efficiency from a bank can be seen through the value of BOPO (Operating Expenses to Revenue Operational). The lower the BOPO ratio, the better the bank in running its business activities[12].

Regarding This is because banks can use existing resources in the company with efficient. One of the businesses run by banking both Sharia and conventional is through the collection of third party funds (DPK). Funds that come from the community is a deposit or participation that will be withdrawn at any time, usually consists of savings, current accounts and time deposits[13]. DPK also describes the liquidity side of a bank. The source of that DPK itself can come from fundraising cheap in the form of savings and current accounts, or funds expensive in the form of deposits[14]. Syariah banking implement a profit-sharing system or a ratio that according to Islam is legal to do[15]. Banking Sharia performs profit sharing calculations by means of profit sharing, namely dividing net profit from business or investment which has been executed. The amount of profit for the bank and the customer has been decided when the contract will be signed. So nothing confusion and check again during business or business is completed[16].

Research results released by Pew The Research Center stated that in 2015, Indonesia was ranked as the country with the largest Muslim population in the world with a population of 219 million or 12.6 percent of the Muslim population worldwide[3]. In addition, on assessment of Islamic Financial Services Industry Stability Report 2020, Indonesia occupies 9th position as a country with assets largest Islamic banking in the world. This,
This study aims to determine several variables that affect the performance of Islamic banks in Indonesia using six variables to test the interrelationships of the variables which later the results of this study will be used in the next study. Multiple regression examines the relationship of the six variables to predict bank performance based on financial ratios.

2 Research Method

Equations

This research started from collecting secondary data from the website of the Indonesian State Financial Services Authority in the form of financial reports of Islamic banking institutions throughout Indonesia starting from 2011 to 2022. From the report several variables were taken to test the performance factors of Indonesian Islamic banks. As for the tool to test or process data, namely the SPSS application with the Multiple Linear Regression method. The author chooses six variables to be tested, namely:

- X1 : CAR
- X2 : NPF
- X3 : FDR
- X4 : BOPO
- X5 : PK
- Y   : ROA

The independent variables are X1, X2, X3, X4, X5 and the dependent variable is Y, while the formulation for the hypothesis is:

1. H1 : there is an effect of X1 (CAR) on Y (ROA).
2. H2: there is an effect of X2 (NPF) on Y (ROA).
3. H3 : there is an effect of X3 (FDR) on Y (ROA).
4. H4 : there is an effect of X4 (BOPO) on Y (ROA).
5. H5: there is an effect of X5 (PK) on Y (ROA).
6. H6: there is an effect of X1, X2, X3, X4, X5 on Y (ROA).

3 Result And Discussion

Table 1

<table>
<thead>
<tr>
<th>NO</th>
<th>YEAR</th>
<th>X1</th>
<th>X2</th>
<th>X3</th>
<th>X4</th>
<th>X5</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2</td>
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</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
As for the calculation results from the SPSS 26 application, the following calculations are generated:

Table 2

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>3,974</td>
<td>5</td>
<td>795</td>
<td>143</td>
<td>000</td>
</tr>
<tr>
<td>Residual</td>
<td>0.022</td>
<td>4</td>
<td>0.006</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3,996</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Dependent Variable: ROA
b. Predictors: (Constant), PK, CAR, NPF, FDR, BOPO

In the Anova table, it is explained that the significance value of F is 0.000 and the value of the degree of freedom 4 which will later be used is used to test the hypothesis on H4.

Table 3

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized B</th>
<th>Coefficient Std.Error</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig</th>
<th>Zero - order</th>
<th>Correlation Partial</th>
<th>Par t</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>3.340</td>
<td>4.035</td>
<td>-8.28</td>
<td>1.45</td>
<td>0.18</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAR</td>
<td>1.126</td>
<td>0.79</td>
<td>4.73</td>
<td>1.58</td>
<td>0.18</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NPF</td>
<td>1.128</td>
<td>1.55</td>
<td>8.03</td>
<td>1.58</td>
<td>0.18</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FDR</td>
<td>0.039</td>
<td>0.21</td>
<td>1.49</td>
<td>0.82</td>
<td>0.38</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BOPO</td>
<td>-0.950</td>
<td>0.23</td>
<td>-4.19</td>
<td>4.19</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PK</td>
<td>1.121</td>
<td>0.82</td>
<td>1.47</td>
<td>1.47</td>
<td>0.15</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From table 3 it is known the value of each variable starting from X1 to X5 to test whether there is an effect on the value of Y and the effect simultaneously when the values of X1 to X5 are tested together which affect the value of Y. So it is necessary to know the value of t table and the value of F table as follows:

\[ T \text{ table} = t \left( \frac{\alpha}{2} ; n - k - 1 \right) \]
b) F Test

$F_{\text{table}} = F(k ; n_{-}k)$

$F_{\text{table}} = F(5 ; 10_{-}5) = F(5 ; 5) = 5.05$

So the result of the hypothesis is:

1. $H_1 =$ it is known that the Sig value for the effect of $X_1$ on $Y$ is $0.187 > 0.05$ and the $t$ value is $1.588 < t_{\text{table} 2.776}$ so that $H_1$ is rejected which means there is no effect of $X_1$ on $Y$

2. $H_2 =$ it is known that the Sig value for the effect of $X_1$ on $Y$ is $0.454 > 0.05$ and the $t$ count value is $0.828 < t_{\text{table} 2.776}$ so that $H_2$ is rejected which means there is no effect of $X_2$ on $Y$

3. $H_3 =$ it is known that the Sig value for the effect of $X_1$ on $Y$ is $0.143 > 0.05$ and the $t$ count value is $1.821 < t_{\text{table} 2.776}$ so that $H_3$ is rejected which means there is no effect of $X_3$ on $Y$

4. $H_4 =$ it is known that the Sig value for the effect of $X_1$ on $Y$ is $0.014 < 0.05$ and the $t$ value is $-4.197 < t_{\text{table} 2.776}$. Because $t_{\text{count}}$ is negative, it uses 2 sides (two-tailed), so $t_{\text{count}} < t_{\text{table} 2.131}$, referring to statistical rules, then $t_{\text{count}} > t_{\text{table} 2.131}$ so that $H_4$ is accepted which means there is an effect of $X_4$ on $Y$

5. $H_5 =$ it is known that the Sig value for the effect of $X_5$ on $Y$ is $0.215 > 0.05$ and the $t$ count value is $1.472 < t_{\text{table} 2.776}$ so that $H_5$ is rejected which means there is no effect of $X_5$ on $Y$.

6. $H_6 =$ it is known that the Sig value for the effect of $X_1, X_2, X_3, X_4, X_5$ on $Y$ is $0.000 < 0.05$ and the calculated $F$ value is $143.56 > F_{\text{table} 5.05}$ so that $H_6$ is accepted which means there is an effect of $X_1, X_2, X_3, X_4$ and $X_5$ simultaneously with respect to $Y$.

Regression analysis is used to measure how much influence between the independent variable and the dependent variable. If there is only one independent variable and one dependent variable, then the regression is called simple linear regression [17]. Conversely, if there is more than one independent variable or dependent variable, it is called multiple linear regression. Multiple linear regression is a regression model that involves more than one independent variable. Multiple linear regression analysis was conducted to determine the direction and how much influence the independent variable had on the dependent variable [18].

From testing the $X_1$ variable on hypothesis 1 to hypothesis 5, it shows that the hypothesis is rejected because $T$ is less than the table value, but when the test on hypothesis 6 shows it is accepted because the $F$ value is greater than the $F_{\text{table}}$ value, which means that if the test is carried out one by one it will be rejected, but the test is carried out with the same variable then it is accepted, meaning that this variable cannot be separated but must be unity. So, to measure the performance of a Sayriah financial institution, it can't be just one component, let alone a separate component, so it must be a unity of all variables that affect the stability of Islamic financial institutions. such as the variables that have been described as follows:

- $X_1 : CAR$
- $X_2 : NPF$
- $X_3 : FDR$
- $X_4 : BOPO$
- $X_5 : PK$
- $Y : ROA$
4 Conclusion

The results of SPSS calculations of the five variables namely X1, X2, X3, X5 have no effect on the value of Y but when simultaneously tested X1 to X5 there is a strong influence on the value of Y, which means that the Return On Asset (ROA) value is influenced by these five variables simultaneously.

The implications of this research result can be used for one of the policy-making components in determining the direction of the vision of Islamic banks, especially when Indonesian Islamic banks are currently undergoing a merger, from the results of the multiregression calculation that the six components cannot be separated to determine the financial stability of Islamic banks.

The recommendation for the next research is research on Islamic banks by predicting the condition of the bank in the future whether it is bankrupt or experiencing a surplus by using the Markov method or using the Bayes classifier, or the two methods can be combined to complete a more accurate prediction process.

References


